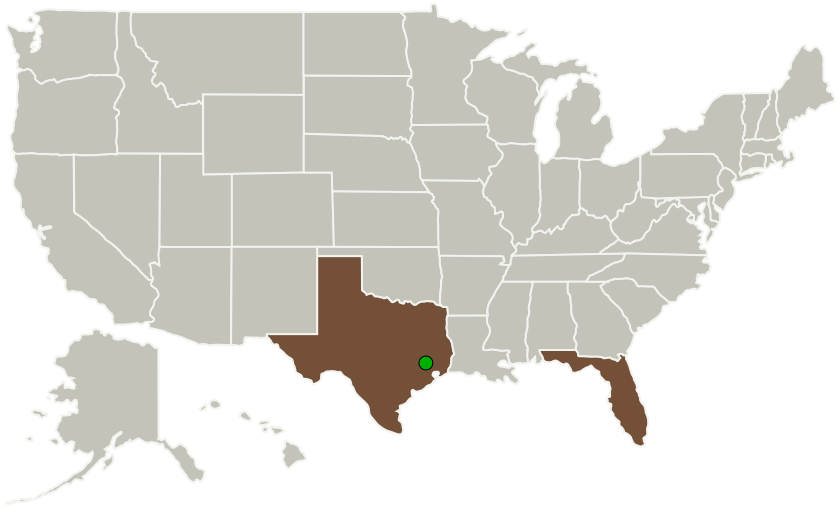
High Lift Heat Pump, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

NASA has identified a need for higher heat rejection temperatures due to an equatorial lunar mission profile, where surface temperatures reach 400 K. To meet this need for space exploration vehicles to reject waste heat to high temperature heat sinks, Mainstream proposes adapting our oil-less vapor-compression (V-C) refrigeration compressor technology for operation at high temperature and high lift. Vapor-compression systems use two-phase heat transfer which reduces component size and mass over single-phase heat pumping cycles such as reverse-Brayton or Stirling. Mainstream?s current oil-less V-C compressor technology is gravity-insensitive, has a long operating life, can be scaled to match various heat loads, and has been mission-proven on the international space station (ISS) placing it at a TRL 9. The proposed development effort will extend this compressor technology to operation at high temperatures and high lift, to which it is inherently well-suited. The resulting compressor will be an enabling technology for the needed high temperature heat pumping systems.

Primary U.S. Work Locations and Key Partners



High Lift Heat Pump, Phase I Briefing Chart Image

Table of Contents

High Lift Heat Pump, Phase I

Completed Technology Project (2017 - 2017)

Organizations Performing Work	Role	Type	Location
Mainstream Engineering Corporation	Lead Organization	Industry	Rockledge, Florida
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Florida	Texas

Images

First vapor-compression compressor to fly in space aboard ISS
(Left)—module in International Space Station
(Right)—Mainstream's compressor with housing removed

Briefing Chart Image
High Lift Heat Pump, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/130328)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Mainstream Engineering Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

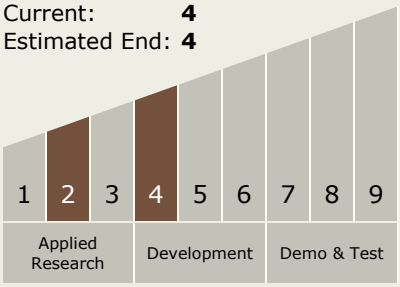
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Joshua Sole

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



High Lift Heat Pump, Phase I

Completed Technology Project (2017 - 2017)

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System